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## GEOMETRY.

Conducted by B. F. FINKEL, Springfield, Mo. All contributions to this department should be sent to him.

### SOLUTIONS OF PROBLEMS.

50. Proposed by B. F. FINKEL, A. M., Professor of Mathematics and Physics, Drury College, Springfield, Missouri.

Divide a triangle into the ratio of  $m$  to  $n$  by a line perpendicular to the base.

Solution by J. C. GREGG, Superintendent of Schools, Brazil, Indiana; E. W. MORRELL, Professor of Mathematics, Montpelier Seminary, Montpelier, Vermont; and the PROPOSER.

Let  $ABC$  be the triangle. Draw the altitude  $BD$ . Divide the base  $AC$  at  $E$  so that  $AE : EC = m : n$ . Draw the line  $BE$ .

Then  $\triangle ABE : \triangle EBC = AE : EC = m : n \dots \dots (1)$ .

Take  $AF$  a mean proportional between  $AE$  and  $AD$ , then draw  $GF$  parallel to  $BD$ .

Then  $\triangle AFG : \triangle ADB = AF^2 : AD^2$ .

But  $AF^2 = AE \times AD$ .

$\therefore \triangle AFG : \triangle ADB = AE \times AD : AD^2 = AE : AD = \triangle ABE : \triangle ADB$ .

$\therefore \triangle AFG = \triangle ABE$  and  $\triangle EBC = FGBC$ .

Hence, using in (1), we have  $\triangle AFG : FGBC = m : n$ . Q. E. D.

Also solved in various ways by G. B. M. ZERR, B. F. YANNEY, J. SCHEFFER, A. H. BELL, F. R. HONEY, O. W. ANTHONY, H. J. GAERTNER, G. I. HOPKINS, J. M. COLAW, J. O. MAHONEY.

51. Proposed by G. B. M. ZERR, A. M., Ph. D., Professor of Mathematics and Applied Science in Texarkana College, Texarkana, Arkansas-Texas.

Construct a trapezoid, given the bases, the altitude, and the angle formed by the intersection of the diagonals.

Solution by J. OWEN MAHONEY, B. E., Graduate Fellow and Assistant in Mathematics, Vanderbilt University, Nashville, Tennessee; FREDERICK R. HONEY, A. B., New Haven, Connecticut; J. SCHEFFER, Hagerstown, Maryland; B. F. SINE, Principal of High School, Rock Enon Springs, Virginia; and PROPOSER.

Let  $a$  and  $b$  be the bases,  $p$  the perpendiculars, and  $A$  the angle between the diagonals.

Take  $BC = a + b$  and describe upon  $BC$  a segment to contain an angle  $= A$ . The problem is possible when  $p$  is less than the greater segment of the diameter perpendicular to  $BC$ . Take  $CE = p$  and perpendicular to  $BC$ . Draw  $EH$  parallel to  $BC$  cutting the circle in  $M$  and  $G$ . Draw  $BG$  and  $GC$ . Also draw  $DF$  parallel to  $BG$  and  $DH$  parallel to  $GC$ .

